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those intellectual and friendly relations with the Sandwich Islands which now existed. He hoped public attention would be drawn to what the Bishop had said with regard to the route, which might be called the circumambient route of the world, that he had suggested. He had shown in how very short a time we might go across the continent of America, and by way of Hawaii to the most interesting parts of the East and back again to England. None of us could forget the interesting visit of the widow of the late sovereign of that country to England, and the affectionate and peculiar interest which her natural qualities and the dignity of manner which she possessed attracted towards herself in this country.

The BISHOP of HONOLULU said the last he heard of Queen Emma was, that she had been engaged in raising a fund for the relief of the distress which had been occasioned by the volcano. She had collected in different parts of the island by her own personal solicitation about 600*l.* She was most unremitting in doing good. Any sentiment of admiration for her dignity, piety, and benevolence which was entertained towards her in this country was amply justified by what she was doing in her own. He could only say he had felt it a great honour to be permitted to communicate matters which he felt to be a very trifling addition to our scientific knowledge. He felt it was a sacred duty everywhere to encourage the diffusion of useful knowledge, and especially of those sciences which enabled us to understand something of the world on which we lived. He felt a minister of religion was in his right position when he was doing all he could to advance the interests of science.

3.—*On the Cape York Peninsula, Australia.* By Dr. A. RATTRAY, M.D., R.N.

THE triangular peninsula which forms the north-east corner of Australia is scantily peopled by small scattered tribes of aborigines. Their number has been variously estimated at from ten to fifteen thousand. They subsist on fish, turtle, roots, fruits, &c.; have no knowledge of agriculture; lead a lazy inactive life; never build huts, but sleep in the open air; have strong migratory propensities; and apparently a total disbelief in a Superior Being or God of any sort: characters which give them a claim to be regarded as among the lowest and most degraded of the human race; although, towards Cape York and the islands of Torrès Strait, there is an evident Papuan admixture, and a correspondingly augmented intelligence.

Separated from the main mass of tropical Australia by the Gulf of Carpentaria, which so deeply indents the north coast, this peninsula, 300 miles wide at its base and over 400 miles long, stretches boldly north till within 10½ degrees of the Equator, washed on both sides by sea, and separated from New Guinea by Torres Strait, only 90 miles wide. Its east coast is skirted from 15 to 50 miles off by a steep submarine wall of coral, termed the Great Barrier-reef. This forms an admirable natural breakwater, and leaves a long passage, often calm as a lake, between it and the shore, along which vessels may proceed to Torres Strait without passing through the reef; and moreover possesses numerous openings or gaps through which those who prefer the rival but rougher outer passage may sail, to make their desired exit into the safer seas beyond.

The rapidly-increasing importance of Australian commerce with India and China gives to Torres Strait and the not yet thoroughly appreciated inner and outer Barrier-reef routes, an interest that they would not otherwise possess. Their advantages and disadvantages are well pointed out in the Admiralty Sailing Directions, and the great question, still unsettled practically, appears to be, which is preferable for sailing ships and which for steamers. The easier course is unquestionably through the open coral-sea, and the navigation of the long tortuous river-like track inside the barrier the more intricate. It is this that causes so many merchantmen to prefer the former, in which the short cut through the reef is the only period of anxiety. But it is during this brief run of two or at most three days, whether through the Raine Island or Bligh's entrance, in which so many vessels are wrecked. Now, why run such risk when it might be avoided?

The triennial trips of H.M.S. *Salamander* up and down the inner route during the past three years whilst protecting Somerset, ought to prove the ease with which it may be traversed under sail or steam in its whole length, including its most intricate portion near Torres Strait, even in dark nights. Although its navigation has been materially benefited by the beacons placed by H.M.S. *Salamander* where most wanted, it might be still further improved. But even now, could merchant mariners, both under sail and steam, be prevailed on to make trial of what is little else than coasting throughout, they would soon prefer it. When rendered safer, and a better class of mail steamers is employed, the inner passage will doubtless become a favourite route to Asia and perhaps to England.

Nowhere will the traveller meet with finer views than in the lower part of the Cape York Peninsula, especially in the vicinity of Cape Tribulation. Here the mountain range which begins near Cape Howe and runs northward skirting the coast and forming the backbone of Eastern Australia, culminates in the curiously peaked "Peter Botte" at a height of 3311 feet, whose sloping sides, wooded from base to summit, deep well-timbered gorges and valleys luxuriant with vegetation, all indicate great fertility of soil. Thence onward, the hills of the now rapidly narrowing peninsula, which still skirt its eastern border from 5 to 30 miles inland, gradually decrease in height, become more irregular and broken as a range, while the land shows less fertility and appears more barren and bare, till, near Cape York, they terminate in a series of undulating downs, of which the highest is not more than 300 feet above the sea-level.

The range which thus traverses the entire length of this peninsula consists, as it does further south, of an axis of crystalline rocks, chiefly of granite, porphyry, gneiss, felspar, and quartz, resting on the eastern and western flanks of which are thick strata of sandstone of the carboniferous age. As yet, however, no gold-bearing gullies or creeks have been found in the former system of rocks, like those of the richly auriferous regions of Victoria, New South Wales, and the Peak Downs, nor copper-mines like those of Burra-Burra, nor valuable and extensive coal-beds in the latter. No coal has been discovered further north than Port Denison. Lying between the volcanic rock and the super-imposed ironstone of the vicinity of Somerset and the adjacent Albany Island, we find a more local and limited deposit, consisting of a coarse quartzoze sandstone, unfit for permanent building purposes. Iron is thus the only known mineral wealth of this peninsula.

Climate is another influence likely to affect the colonisation of the Cape York district. It is therefore important to ascertain its nature, and whether it is healthy or the reverse. Lying between the 10th and 17th parallels of south latitude it is entirely tropical. A line drawn obliquely across the peninsula from Cape Flattery to the bottom of the Gulf of Carpentaria forms a marked division inasmuch as all to the northward lies in the monsoon district, and all to the southward in the trade-wind region. In both, the year may be divided into the wet and dry seasons; and if we confine our attention to Somerset and the monsoon portion we find that the former corresponds with the north-west and the latter with the south-east monsoon. Variable winds and other atmospheric vicissitudes prevail as the one monsoon merges into the other; a period which the natives, who, according to Macgillivray, divide the year into three, term the Malgui or change; the others being Aibu or fine weather, and Kuki or wet weather. This region, in fact, forms the south-east corner of the great monsoon quadrilateral of the Indian Ocean, and the imperfect development of the north-west wind over this peninsula is doubtless due to its limited area, which forms a circumscribed heating surface, the influence of which is still further modified by proximity to the extensive sheets of water which bathe it on either side. If this peninsula did not exist there would be no north-west monsoon, and the south-east wind, which now prevails for nine or ten months, would blow all the year through. On the other hand, the unusual length of the south-east breeze is due to the warming influence of the sub-equatorial surfaces of the huge islands of the Indian Archipelago and their shallow inter-insular seas, which strengthens what may in fact be regarded as an intensified south-east trade. The highly developed periodic winds of India and China are totally distinct from the less decided ones of Australia. The two, however, come in close contact at the Equator; but necessarily blow, as the corresponding trades do, in different directions and with dissimilar force. Thus, while those of India are S.W. and N.E., those of North Australia are S.E. and N.W., owing to the relative position which the land on either side bears to the central sea. Moreover, while the south-west monsoon of the northern hemisphere prevails during the same months as the south-east of the southern continent, the former is rainy and the latter dry: while, on the other hand, the opposite or north-east monsoon of India blows during the same part of the year as the north-west of Australia; but the former constitutes the dry and the latter the moist or rainy season. Thus in either hemisphere it is the breeze which blows from the Equator, *i. e.*, the warmest part of the Indian Ocean, to the north or south respectively, which is the rainy wind, and that which comes from landward the dry breeze.

Two peculiarities in the south-east trades and monsoons of north-east Australia are worthy of notice. Beyond a certain distance from the land they preserve their proper course; but those which impinge on the coast, on coming in contact with the mountain range which closely skirts it, take more or less the trend of the land, which however has a general south-east and north-west direction, and hence vary with every headland and bay. The still loftier chain, which traverses Papua in a line nearly perpendicular to this, has doubtless a similar influence on these south-east winds: and here we have a solution of the problem why this monsoon increases so much in strength as it nears Torres Strait. The convergent coasts of the Cape York Peninsula and New Guinea form a funnel which has this narrow channel as an outlet, through which the pent-up air rushes with great force, especially during July, August, and September, when the heating power of the sun on the high land and shallow-sea surfaces of the Indian Archipelago is apparently greatest. After passing through this strait, the breeze again spreads out and blows less strongly in the Arafura Sea, where its humidity, markedly augmented on the eastern side, also decreases.

The period of change of the monsoons of Torres Straits varies considerably in different years; and to ascertain the exact or probable time is not only a matter of great scientific interest, but of by no means light importance in a mercantile point of view, in connexion with the traffic between our Australian colonies, India, China, and England.

In the dry season the thermometer ranges from 61° to 85° (shade), and during the wet from 75° to 90° Fahr. The annual range is about 28°, and the average annual temperature 78° Fahr. The rainfall varies considerably in different years, both in the wet and dry seasons. In 1866 it amounted to 103 inches, during the previous twelve months to considerably more, and in 1867 very much less. Fogs and mists are only common in the wet monsoon, when thunder and lightning are also frequent, with squalls and heavy rains. The electric explosions, however, are seldom near the earth, but usually distant and dully heard high overhead in the dense masses of rain cloud, and unattended with such danger to life and property as in Queensland, where the altitude is often less, and deaths therefrom by no means rare.

It will thus appear that here, as elsewhere, various influences combine to form and modify the winds and climate of the Cape York Peninsula. Proximity to the sea is one of the greatest of these. The effect of shallow waters in tropical regions, not only in raising the temperature of the air, but in producing currents both in the aërial and aqueous oceans, does not appear to be sufficiently appreciated by physical geographers. Near a beach in the vicinity of Somerset, I found the temperature of the sea 200 yards from the shore, where the water was 54 feet deep, to be 82½° Fahr.; *i. e.*, half a degree above the air (82° Fahr.); while 5 feet from the shore, where the depth was only half a foot, it was 84¾° Fahr.; in other words, 2¼° Fahr. higher. Now much of the Torres Strait region, which embraces an area of several hundreds of square miles, consists of coral-reefs and shoals, dry at ebb, and covered by only a few feet at high water, the heating of which by the sun overhead necessarily raises the temperature of the atmosphere, and creates an indraught of colder air; which, conjoined with other causes already explained, is the reason why the south-eastern monsoons increase in force as we approach this strait: and also why rainy south-west winds occur during the north-west monsoon. Originally, humid north-west winds, which, according to Maury, are merely the north-east trades of the northern hemisphere deflected, they reach the shallow highly heated Gulf of Capentaria, which renders them, if possible, still more humid, and here come under the influence of the indraught, caused by the still shallower waters eastward of Cape York, towards which they turn. The deflection seriously influences the meteorology of the western portion of the Cape York Peninsula and adjacent part of the gulf, which get little of the moisture these north-west winds would bring, as also happens with the south-east trades and monsoons; and hence it is why much of this land is parched, cheerless, scantily vegetated, and characterized by a climate with irregular light winds, frequent calms, and alternate thunder-storms. In the shallow seas which lie between the north coast of Australia and Asia, and bathe the numerous islands of the Indian Archipelago, we have a still more extensive heating surface, which warms sooner and more highly, and preserves its temperature better than the far deeper Pacific and Indian Oceans on either side. And it is to this, conjointly with the caloric emanating from the land surfaces, that the position of the thermal equator, which runs through this region, is due. This is the only part of the globe where it lies to the southward of the physical equator; and nowhere does it take a greater bend than here, in curious contrast to the isotherm of Sydney, which is perhaps the straightest of all isotherms. Beyond Java the thermal equator again takes a very large north-ward curve as the influence of this district declines, and the effect of the extensive continent of Asia comes into full and unopposed play. It is to the less favourable circumstances in which Port Essington, situated in the same latitude, but 600 miles further west, is placed, which makes its average annual temperature 5° Fahr. higher than that of Somerset; viz., a greater land surface behind it, conjoined with the slighter cooling influence of its weaker south-east monsoon, and the higher heating effect of its stronger and more prolonged north-west winds. And, again, it is because still more advantageously situated close to the sea, to a cold coast current, and the lofty Andes, that Callao and Lima, which lie in about the same latitude of the opposite shore of the Pacific, enjoy a temperature 5° Fahr. under that of Somerset (73° Fahr.).

The ocean-current tides and prevalent winds also greatly affect the climate of this region. Rossel's drift, which near Cape York, forms a one-knot current, warmed in a lengthy circuit of several thousand miles among the islands of the South Pacific, in a subtropical latitude, has necessarily become a warm stream long ere it reaches the vicinity of Torres Strait, especially during the north-west monsoon season, when the sun is in the southern hemisphere, and hence overhead, when the heat of its waters is usually only a few degrees either above or below that of the air. This doubtless tends slightly to raise the average annual temperature of Somerset, but acts still more in equalising and limiting it. The effect of the strong three or four knot tidal currents which set through Torres Strait either way, on the climate, is not very apparent; but they probably have a cooling, or rather an equalising influence, and act by mixing the surface waters as they become heated with the cooler layers below, so as to reduce the temperature of the whole, and indirectly decrease that of the air overhead, heated principally by radiation. If no such tides and currents existed, we may conceive how warm these shallow waters would become, how hot the air over them, and how sultry the climate. Again, the influence of the south-east trades and monsoons in reducing the temperature is very marked. Coming cool and moisture-laden from the South Pacific they render the winter enjoyable, while without them the heat would be much more oppressive and unhealthy than it is. Move out of the breeze, and the atmosphere becomes hot and stifling in the full glare of the sun. Their temporary cessation, during the morning and evening calms, often illustrates this, and makes their value in tempering this season very apparent. On the other hand, the effect of the humid north-west winds is to render the weather sultry, debilitating, and sickly.

The physical features and geology, not only of this peninsula, but of Australia as a whole, necessarily influence the temperature, winds, and rainfall. From the extensive flat, arid, and almost rainless interior come the dry south-west winds prevalent in the Albert River district, and adjoining base of the peninsula as far north as the Mackenzie River. The deflection of the south-east winds by the mountains which traverse the peninsula, and of the north-west monsoon by the furnace-action of Torres Strait, accounts for the great difference in the climate to the east and west of the range, as well as for the character of the vegetation in its badly watered western and better supplied eastern slopes and adjacent country. While, again, it is the rapid decrease, both in height and area, of the peninsula that causes the slight rainfall of its northern part during the south-east monsoon, the fewness and unimportance of its streams, its parched soil, and its scanty and imperfectly tropical vegetation.

The characteristic aspects of the wet and dry seasons at Somerset are widely different; nor is this more marked in the inanimate world than in the animal and vegetable kingdoms. As in the tropics generally, there is here no real winter, and throughout the year perpetual summer seems to smile. Nothing can be more wonderful than the difference noticeable, even in a few days, after the advent of the north-west monsoon, with its profuse and invigorating rains; grasses, ferns, &c., soon shoot forth, and grow with amazing rapidity; buds sprout and flowers bloom, till soon the whole country, profusely covered with vegetation, and clad in a gorgeous robe of bright green, variegated with gay flowers, assumes more the aspect of a tropical land, than during the more lengthy dry south-east monsoon, and yields a strong contrast to its late parched, cheerless character. In this change the animal kingdom participates. From every crevice in the perforated ironstone rock, every hole burrowed in the hard, stony soil, scorpions and lizards come forth, and snakes, *e. g.*, the carpet-snake, often 12 feet long, and the rarer common brown snake and death adder; while occasionally the huge gavial, 20 or 25 feet long, tempted from the not far distant muddy and mangrove-fringed bays which lie towards Cape York, shows its serrated back, as it floats lazily with the tide through the adjacent Albany Pass; or the ungainly sun-fish, as it swims along with the peculiar fan-like motion of its dorsal and ventral fins. The air is alive with the hum of the native bee, the chirp of the cricket, and the song or cries of pairing birds, among which the black cockatoo, the common yellow-crested white cockatoo, the parraqueet, the rare and beautifully plumaged rifle-bird (*Ptilorus magnificus*), and a pretty migratory wood-kingfisher (*Tanysiptera sylvia*) are especially noticeable. Soon after the cessation of the rain, however, the flowers wither. The lacertæ and ophidiæ return to their subterranean haunts to hybernate; the few migratory birds which annually visit Cape York from New Guinea and the intervening islands are no longer seen; the ground becomes more and more parched; the streamlets occasionally met with in the gullies during the other monsoon now dry up; while the few streams in the neighbourhood dwindle down to a low ebb.

On the salubrity of Somerset will depend much its future as a field for successful settlement, and the number and class of emigrants likely to resort thither. Those of European extraction wisely prefer a healthy, and if possible a cool climate; and if that of this region is both sickly and sultry, it will probably influence the prospective population, by limiting the influx of the white races: and leading to the emigration of Chinese, Malays, South Sea Islanders, &c., in whom exposure to solar heat causes neither inconvenience nor risk to health, and by whom heavy out-door work may be done. Extra-tropical Australia is rightly regarded as one of the healthiest of our foreign possessions, and well adapted for the European constitution. But does this hold good with regard to the warmer Cape York district? The insalubrity of Port Essington first led to the belief that inter-tropical Australia was unhealthy as a whole; an idea which that of the Albert River district, at the bottom of the Gulf of Capentaria, appears to confirm. There is little doubt, however, that in both instances this is exceptional, arises purely from local causes, especially proximity to marshy land, and does not extend to the whole of the north coast.

For at least eight or nine months of the year the climate of Somerset and entire eastern coast is fine for a tropical latitude. Moreover, no malarious or other local influences exist to render either of them unhealthy, and hence the climate at this season is remarkably genial for so low a latitude. The remaining three or four months of the rainy season are both less pleasant and healthy, and though the young and vigorous may withstand, perhaps for some years, the debilitating influence even of this trying period, various ailments are apt to occur, especially among the enfeebled. We find here no exception to the great law, that change from a cold to a warm zone is sooner or later inimical to health, and may prove productive of disease if not mortality in the white constitution, which attains its most perfect development, highest health, and longest life, only between the lines of the fortieth and forty-fifth degrees of north or south latitude. Occasionally the young and vigorous appear to flourish and even fatten for a time, but with the majority the reverse is the case. The climatic effect observable in the 240 sheep taken north from Brisbane, to supply Somerset on its first settlement, is interesting and tends to support this opinion. Under the withered herbage of the dry season, a scanty water-supply, and the hot atmosphere, they diminished in bulk to an average weight of 25 lbs. After the advent of the wet season, however, with its profuse succulent herbage, they soon gained in weight. But, half-starved thus for eight months, and overfed during the remainder of the year, a result otherwise than injurious to the breed, both as to carcass and wool, could not be expected. The wool of New Zealand, New South Wales, and other colonies of extratropical Australia, is decidedly superior to that of Northern Queensland; and it may be laid down as a law, that the warmer the climate the more degenerate the fleece.

From this review it will be obvious that the capabilities of the Cape York Peninsula, and its solitary township Somerset, are not of the most promising nature, and that we must not be too sanguine as to the future of either. But this may not, and probably does not hold good with regard to Tropical Australia as a whole; and the more extensive and better watered tract which lies to the west of the Gulf of Carpentaria, in which there appears to be both unlimited latitude for settlement and a more promising soil, may yet prove a valuable part of this southern continent, and be in some respects the India of Australia.

This paper will be printed entire, with map, in the 'Journal,' vol. xxxviii.

The PRESIDENT said this paper was one of the many proofs we had had of the scientific abilities of our naval men employed upon the eastern coast of Australia. He would not allude to all that Captains Stanley, Blackwood, or Richards had done upon that coast. He regretted that Captain Richards, the hydrographer, was not present to state what he knew of the researches of Dr. Rattray, who, on board the *Salamander*, employed himself in investigating the physical geography, climate, natural history, and currents, in a way similar to that which Charles Darwin did when accompanying Admiral Fitzroy in his great explorations in the *Beagle*. The manner in which the paper had been put before them must have made all aware of the great qualifications of Dr. Rattray; especially the beautiful manner in which he had brought out the effect produced by the configuration of land and sea upon the nature of the climate. Before calling attention to another small paper which was to be read, he begged to inform the Society that the Council had determined upon applying to her Majesty's Government, through the Secretary of the Colonies, to contribute by their influence and recommendation to the exploration of Australia, from north-east to south-west, across the whole continent, as proposed by Dr. Neumayer at the last meeting. The expedition was to include several men of science, and was to be provided with a number of horses and camels; and to be, in short, the greatest and most important Australian expedition ever attempted. The expense would fall on the colonies, and, from the spirit which animated their governments, he was earnestly hopeful that they would readily acquiesce in the proposal. But it was desirable that scientific Societies like their own, and the Royal Society in particular, should lead the way in recommending this project. The Council of the Geographical Society had accordingly represented to her Majesty's Government the desirability of approving and recommending to the colonial governments the adoption of this great traverse. Dr. Neumayer intended to fall, in latitude 23°, into what he believed to be the principal watery region of Australia, where he can find subsistence; and he had so arranged his journey by stoppages at certain stations, that when he arrived at the central point which Macdougall Stuart reached, he would be able to obtain any supplies that might be required from Adelaide. It was hoped that he would come out at Swan River. This great project had been warmly approved by the Council of the Society.

The PRESIDENT further added that there was one other subject to be noticed at this meeting: it was only mentioned to him that morning by Professor Tennant. There had been discovered in our own settlements on the Orange River, to the north of the Cape of Good Hope, some valuable diamonds. Two of them, which he had seen himself, were now in the possession of Messrs. Garrard. One of them Professor Tennant told him was worth 400*l*., and another 200*l*. This was a new geographical fact as to the distribution of mineral matter, and he was glad that Professor Tennant had this opportunity of placing it on record in the 'Proceedings' of the Society.

4.—*On the Discovery of Diamonds at Hope Town in the Cape Colony.*

By PROFESSOR J. TENNANT, F.R.G.S.

PROFESSOR Tennant said he had listened with great attention to the last address of the President of the Society, and had ventured to suggest an omission, viz. the finding of diamonds in a new locality—the Cape Colony. He considered the subject of such importance that it ought